

# Work Order ID 74331

Wednesday, September 28, 2011 1:20:46 PM

Page 1

Item ID: D212-664-101

Accept

Setup Start

Revision ID:

Stop

Item Name: Crosstube Fwd

Start Date: 9/28/2011 Start Qty: 1.00

Cust Item ID:

Required Date: 10/19/2011 Req'd Qty: 1.00

Customer:

Reference:

Approvals: Process Plan: MLJ Date: 11/09/28 Tooling: \_\_\_\_\_ Date: \_\_\_\_\_

QC: \_\_\_\_\_ Date: \_\_\_\_\_ SPC (Y/N): \_\_\_\_\_ Date: \_\_\_\_\_

Run Start

Stop

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
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Draw Nbr	Revision Nbr
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D212-664-141	Rev D (DEO)
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100 0.00



DOCUMENT CONTROL

DC

Memo

0.00

Document Control

Photocopy bluefile and create labels as per PPP D212-664-101 CHG005

8 11/10/17

JW MLJ 11-10-17

110 0.00



Pick Kit

Packaging

Memo

0.00

Packaging

Packaging

JW 11-10-04

120 0.00



BENDING MACHINE - CROSSTUBES

CNC Bend 2

Memo

0.00

CNC Alpha 160 Bender

Bend tube as per Dwg D212-664-141 using CNC bender program 212-fw and Folio D212-664-101

JW 11-10-04

**Dart Aerospace Ltd**

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_  
 Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
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**NOTE:** Date & initial all entries

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130

QC15- Crosstube Dimensional Check

0.00



QC

Memo

0.00

S 11/10/04



Quality Control

140

Crosstubes

0.00



Crosstubes

Memo

0.00

1-Drill pilot holes in tube as per Dwg D212-664-141 using drill Jig DT8548 &amp; DT8549, using drill table DT8577, set-up towers in hole #7 as per QSI 10

2-Ream hole to finish size in tube as per Dwg D212-664-141 using drill Jig DT8548 &amp; DT8549. Check dimensions between holes, both sides on both cuffs, to ensure alignment with saddle holes.

3-Scribe part # and batch # using vibrating stylus as per Dwg D212-664-141

4-Deburr &amp; Inspect for surface damage. Repair damage within limits as per Dwg D212-664-141

DT 11-10-04

DT 11-10-05

**Dart Aerospace Ltd**

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Stop

QC: \_\_\_\_\_ Date: \_\_\_\_\_ SPC (Y/N): \_\_\_\_\_ Date: \_\_\_\_\_

Sequence ID/  
Work Center IDOperation  
DescriptionSet Up/  
Run Hours

Tool ID

Tool #

Plan  
CodeAccept  
QtyReject  
QtyReject  
NumberInsp.  
Stamp

150

Crosstubes Chemical Conversion

0.00



HandFXtube:

Memo

0.00

Hand Finishing Crosstubes

Chemical Conversion Coat within 24 hours of bending and drilling

IT 11-10-05

160

QC5- Inspect part completeness to step on W/O

0.00



QC

Memo

0.00

Quality Control

M 11 10 05

170

Outsource process - NDT per QSI038 4.1

0.00



Outsource2

Memo

0.00

Outsource process - NDT

Liquid Penetrant Inspection as per QSI 038  
Issue P/O: 15101  
LPI as per ASTM 1417 Level 2  
Attach copy of NDT results to work order

11-10-6

**Dart Aerospace Ltd**

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**Part No:** \_\_\_\_\_ **PAR #:** \_\_\_\_\_ **Fault Category:** \_\_\_\_\_ **NCR:** Yes No **DQA:** \_\_\_\_\_ **Date:** \_\_\_\_\_  
**Resolution:** \_\_\_\_\_ **Disposition:** \_\_\_\_\_ **QA: N/C Closed:** \_\_\_\_\_ **Date:** \_\_\_\_\_

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Customer:

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Approvals: Process Plan: \_\_\_\_\_ Date: \_\_\_\_\_ Tooling: \_\_\_\_\_ Date: \_\_\_\_\_

Stop



QC: \_\_\_\_\_ Date: \_\_\_\_\_ SPC (Y/N): \_\_\_\_\_ Date: \_\_\_\_\_

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
180	Receive & Inspect for Damage & Mat'l Certs	0.00							
	Packaging								
Packaging	Memo	0.00							
Packaging	Ensure copy of NDT results attached to work order.								
190	QC5- Inspect part completeness to step on W/O	0.00							
QC	Memo	0.00							
Quality Control	Inspect for damage & ensure results are as per Dwg D212-664-141								

\_\_\_\_\_ *Revised* (1)

*nl* 11 0 06

**Dart Aerospace Ltd**

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Customer:

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Approvals: Process Plan: \_\_\_\_\_ Date: \_\_\_\_\_ Tooling: \_\_\_\_\_ Date: \_\_\_\_\_

Stop



QC: \_\_\_\_\_ Date: \_\_\_\_\_ SPC (Y/N): \_\_\_\_\_ Date: \_\_\_\_\_

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200

Spray Painting per QSI005 4.2

0.00



SprayPaint

SprayPaint

Memo

0.00

Spray Painting

1-Prime inside and outside crosstube as per QSI 005 4.2

2-Paint outside crosstube as per DEO D212-667-141 with White Imron as per QSI 005 4.2

PRIME:

Start Time: \_\_\_\_\_

Finish Time: \_\_\_\_\_

11-10-12

PAINT:

Start Time: \_\_\_\_\_

Finish Time: \_\_\_\_\_

11-10-13

RT 11-10-13

210

QC14- Inspect Spray Paint

0.00



QC

Memo

0.00

Quality Control

Then, Wrap in plastic bag to protect from scratches

11 10 14 (1)

**Dart Aerospace Ltd**

W/O:		WORK ORDER CHANGES					
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**Part No:** \_\_\_\_\_ **PAR #:** \_\_\_\_\_ **Fault Category:** \_\_\_\_\_ **NCR:** Yes No **DQA:** \_\_\_\_\_ **Date:** \_\_\_\_\_  
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Stop



QC: \_\_\_\_\_ Date: \_\_\_\_\_ SPC (Y/N): \_\_\_\_\_ Date: \_\_\_\_\_

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220

0.00



Crosstubes

Crosstubes

Memo

0.00

1-Abrade mating surfaces of support and crosstube with 400 grit sandpaper,  
clean the area with 4105S wash 'n' wipe2-Install supports with Proseal 890 per DSI9563 and QSI 015  
A/R Proseal 890 Batch: 118234

3- Torque bolts as per dwg

25 11-10-14

230

0.00



QC6- Inspect dimensions to drawing

QC

Memo

0.00

Quality Control

W 21 10 17 ①

240

0.00



Pick Kit

Packaging

Memo

0.00

Packaging

11/10/11

**Dart Aerospace Ltd**

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Reference:

Run Start



Approvals: Process Plan: \_\_\_\_\_ Date: \_\_\_\_\_ Tooling: \_\_\_\_\_ Date: \_\_\_\_\_

Stop



QC: \_\_\_\_\_ Date: \_\_\_\_\_ SPC (Y/N): \_\_\_\_\_ Date: \_\_\_\_\_

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
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250 QC4- 100% Inspect kits for completeness

0.00

0.00 *8/10/12*

QC

Memo

Quality Control

260

0.00

0.00 *Rev H*

Packaging

Packaging

Memo

Packaging

Identify and pack for shipping as per PPP D212-664-101

*11/10/12*

270

0.00

0.00



QC

Memo

Quality Control

QC21- Final Inspection - Work Order Release

*11/10/12*  
*ME 11-10-12*

# Dart Aerospace Ltd

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DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

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**NOTE:** Date & initial all entries

# Picklist Print

Page 1

Wednesday, September 28, 2011 1:20:51 PM

Work Order ID: 74331

Parent Item: D212-664-101

Parent Item Name: Crosstube Fwd



Start Date: 9/28/2011

Required Date: 10/19/2011


Start Qty: 1.00

Required Qty: 1.00

Comments: IPP Rev:E 04.02.16 Reformat KJ/DS  
 IPP Rev:F 06-03-29 Remove Comments on Pick List JLM  
 IPP Rev:G 07-04-30 As per Rev C JLM IPP Rev:H  
 11.04.26 inspection strip ecn 11-549 EC verified by:DD

Component Item ID/ Item Name	Replacement Item ID	Mfg/ Purch	Bin Item	Primary Location	Last Location	Route Seq ID	Unit of Measure	Qty on Hand	Qty per Kit	Total Qty	Qty Issued	Date Issued	Status
D212-664-101TRN 		Manufactured	No	B74248		110	Each	2.0000	1	1		11-10-04	
Crosstube Turning Detail													

Location	Loc Qty	Loc Code
FG	1	
54731	0	
54732	0	
73708	1	
FG046	1	
68584	0	
73709	1	

D3595-063-450	Manufactured	No	230	Each	43.5600	4	4.210526
							<u>85</u>
RUBBER CUSHION							

Location	Loc Qty	Loc Code
LG	9.76	
67353	3	
68893	6	
70113	0.56	
71354	0.2	
LG055	33.8	
72967	33.8	

**Dart Aerospace Ltd**

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Wednesday, September 28, 2011 1:20:51 PM

Work Order ID: 74331



Parent Item: D212-664-101



Parent Item Name: Crosstube Fwd

Start Date: 9/28/2011

Required Date: 10/19/2011

Start Qty: 1.00

Required Qty: 1.00

MS21920-25

Purchased

No

220

Each

60.0000

4

4



Clamp(per MIL-DTL-8783C)



RT 11-10-14

## Location

## Loc Qty

## Loc Code

LG

54

113281

0

113282

0

118142

4

118183

50

LG050

6

116264

2

117998

4

X4 11-11

D2893-1

Manufactured

No

220

Each

2.0000

2

2



2.75 Support



RT 11-10-14

## Location

## Loc Qty

## Loc Code

LG052

2

72586

2

X2

D3428-1

Manufactured

No

240

Each

29.0000

1

1



Placard



11/11/12

## Location

## Loc Qty

## Loc Code

ST053

29

72048

9

73498

20

1

**Dart Aerospace Ltd**

W/O:		WORK ORDER CHANGES					
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Parent Item Name: Crosstube Fwd

Start Date: 9/28/2011

Required Date: 10/19/2011

Start Qty: 1.00

Required Qty: 1.00

AN6-35A  
BOLT

Purchased No

240 Each 72.0000

4 4

Location

Loc Qty

Loc Code

ST343

72

118422

42

118838

30

AN6-36A  
Bolt

Purchased No

240 Each 73.0000

4 4

Location

Loc Qty

Loc Code

ST343

73

118012

1

118422

42

118838

30

MS21042L6  
Nut

Purchased No

240 Each 1,904.000

6 6

Location

Loc Qty

Loc Code

ST300

904

117677

200

118384

8

118927

96

118968

600

ST518

1000

119075

1000

AN960JD616  
Washer

NAS1149D0663J Purchased

No

240 Each 0.0000

18 18

M118206 11/10/11

**Dart Aerospace Ltd**

W/O:		WORK ORDER CHANGES						
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74331

DRAWING NO. D212-664-141	TITLE CROSSTUBE ASS'Y (205 HI FWD)	REV. D	<b>DART AEROSPACE LTD ENGINEERING ORDER</b>	D.E.O. NO. D212-664-141-D-2	SHEET NO. SHEET 1 OF 1	SCALE NTS
DRAWN <i>UP</i>	CHECKED <i>ASS</i>	MFG. APPR. <i>AB</i>	APPROVED <i>MD</i>	DE APPR. <i>TH</i>		
DATE 11.07.15	DATE 11.07.20	DATE 11.07.21	DATE 11/07/21	DATE 11.07.21		

**PURPOSE:**

REPLACE MAGNOBOND WITH PROSEAL.

**CHANGE:**

IS:

Item	Qty -141	Qty -141B	Part Number	Description
7	A/R	A/R	PROSEAL 890 B-2	SEALANT, AMS-S-8802 CLASS B-2

WAS:

7	A/R	A/R	MAGNOBOND 8398	ROCKWELL SPECIFICATION RBO-120-023 ADHESIVE (TEXTRON/BELL SPEC. 299-947-100, TYPE II, CLASS 2 ADHESIVE)
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NOTE 12 & 15, SHEET 1 IS AMENDED AS FOLLOWS:

IS:

- 12) TO INSTALL D2893-1 SUPPORT: ABRABE MATING SURFACE OF SUPPORT AND CROSSTUBE WITH 180-GRIT SANDPAPER AND REMOVE RESIDUE WITH MEK (OR EQUIVALENT). APPLY A 0.04" TO 0.07" THICK LAYER OF PROSEAL 890 CLASS B-2 (OR AMS-S-8802 CLASS B-2) SEALANT TO MATING SURFACE OF SUPPORT.
- 15) TORQUE CLAMPS 80 TO 100 IN-LB. ENSURE AT LEAST 1.5 THREADS SHOWING IN SAFETY AND THAT NUT HAS NOT BOTTOMED-OUT AFTER TORQUING. **PRIOR TO PACKAGING, RE-CHECK TORQUE ON CLAMPS AFTER PROSEAL 890 SEALANT HAS CURED FOR 72 HOURS.**

WAS:

- 12) INSTALL D2893-1 SUPPORT USING 0.03" TO 0.06" THICK LAYER OF MAGNOBOND 6398 TO THE SURFACE OF D2893-1 THAT WILL BE IN CONTACT WITH THE CROSSTUBE PER QSI 015. LET CURE FOR 12 HOURS AFTER INSTALLATION AND PRIOR TO PACKAGING.
- 15) TORQUE CLAMPS 80 TO 100 IN-LB. ENSURE AT LEAST 1.5 THREADS SHOWING IN SAFETY AND THAT NUT HAS NOT BOTTOMED-OUT AFTER TORQUING.

RECEIVED  
2011-07-28

**Dart Aerospace Ltd**

W/O:		WORK ORDER CHANGES					
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Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

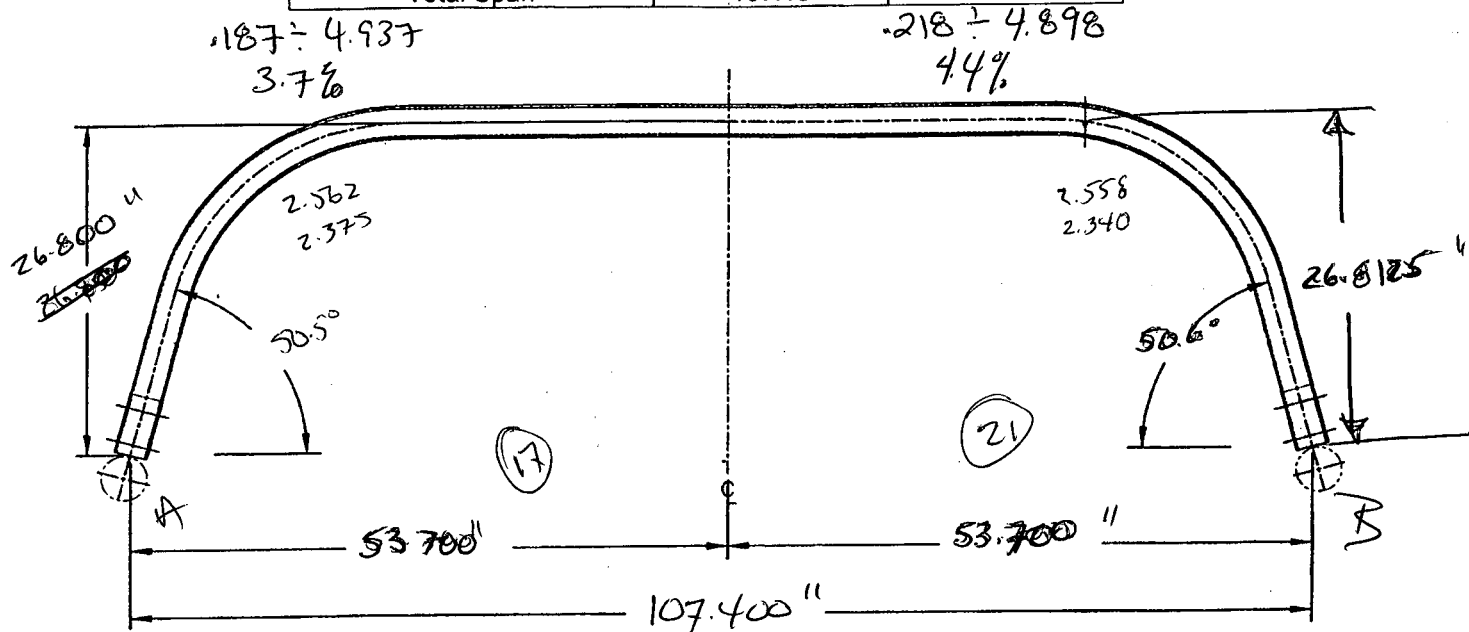
Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

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DART AEROSPACE LTD		Work Order:	74331
Description: Crosstube High Fwd (205/212/412)		Part Number:	D212-664-101
Inspection Dwg: D212-664-141 Rev: D		Page 1 of 1	

Required Dimension	Min	Max
Height	26.79	27.05
1/2 Span	53.59	53.85
Angle	49	52
Total Span	107.18	107.7



Comments
S.NR A = 3.7% crushing @ 17 Passes
S.NR B = 4.4% crushing @ 21 Passes

QC15 Inspection	S
Date	11/10/04

Rev	Date	Change	Revised by	Approved
A	07.02.06	New Issue	KJ/JM	
B	07.05.31	Dimensions updated per Dwg Rev C	KJ/JM	
C	10.04.01	Dwg Rev updated	KJ	

**Dart Aerospace Ltd**

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B		Sign & Date	Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng				

**NOTE:** Date & initial all entries



Item	Qty -141	Qty -141B	Part Number	Description
1	X		D212-664-141	CROSSTUBE ASSEMBLY (205/212/412 HIGH FWD)
2		X	D212-664-141B	CROSSTUBE ASSEMBLY (214 HIGH FWD)
3	1	1	D6005-128	CROSSTUBE
4	2	2	D2893-1	SUPPORT
5	4	4	D3595-063-450	RUBBER CUSHION
6	4	4	MS21920-25	CLAMP (OR MS21920-26)
7	A/R	A/R	MAGNOBOND 6398	ROCKWELL SPECIFICATION RBO-120-023 ADHESIVE (TEXTRON/BELL SPEC. 299-947-100, TYPE II, CLASS 2 ADHESIVE)

#### GENERAL NOTES:

- MATERIAL: MANUFACTURED FROM D6005-128  
FINISHED LENGTH = 126.514±0.020
- FINISH: CHEMICAL CONVERSION COAT PER DART QSI 005 4.1  
PRIME INSIDE AND OUTSIDE PER DART QSI 005 4.2  
PAINT OUTSIDE PER DART QSI 005 4.2
- TOLERANCES ARE PER DART QSI 018 UNLESS OTHERWISE NOTED
- UNITS: INCHES UNLESS OTHERWISE NOTED.
- BREAK SHARP EDGES: 0.005 TO 0.010 MAX.
- IDENTIFICATION: SCRIBE DART PART NUMBER "D212-664-XXX" AND BATCH NUMBER ON INSIDE OF CUFF  
USING VIBRATING STYLUS
- WEIGHT: D212-664-141 = 33.6 lbs (PER IIN-D212-664)  
D212-664-141B = 33.6 lbs (PER IIN-D212-664)
- PART IS SYMMETRIC ABOUT CENTERLINE.
- RUN CUTTER OFF PART. BLEND OUT EDGE LONGITUDINALLY, TRANSITION SHOULD BE SMOOTH.
- BEND PROGRESSIVELY WITH A MINIMUM OF 3 PASSES. MAXIMUM TUBE FLATTENING DUE TO BENDING IS 6% BASED ON O.D.
- LIQUID PENETRANT INSPECT OUTSIDE SURFACE OF CROSSTUBE PER QSI 038.
- INSTALL D2893-1 SUPPORT USING 0.03" TO 0.06" THICK LAYER OF MAGNOBOND 6398 TO THE SURFACE OF D2893-1 THAT WILL BE IN CONTACT WITH THE CROSSTUBE PER QSI 015. LET CURE FOR 12 HOURS AFTER INSTALLATION AND PRIOR TO PACKAGING.
- INSTALL MS21920-25 CLAMPS (OR -26) WITH D3595-063-450 RUBBER CUSHIONS TO SECURE THE D2893-1 SUPPORT ON TOP SIDE OF THE CROSSTUBE. ENSURE CLAMPS ARE OPPOSITE OF CROSSTUBE SUPPORT.
- EXTREME CARE MUST BE TAKEN TO PROTECT THE OUTSIDE SURFACE OF THE TUBE. THE OUTSIDE SURFACE MUST BE SMOOTH AND FREE FROM SURFACE DEFECTS SUCH AS SCRATCHES, NICKS, OR DENTS. DEFECTS UP TO 0.005" MAY BE BLENDED OUT LONGITUDINALLY. CIRCUMFERENTIAL GRIND MARKS ARE UNACCEPTABLE.
- TORQUE CLAMPS 80 TO 100 IN-LB. ENSURE AT LEAST 1.5 THREADS SHOWING IN SAFETY AND THAT NUT HAS NOT BOTTOMED-OUT AFTER TORQUING.

SHOP COPY  
RETURN TO  
ENGINEERING  
UNCONTROLLED COPY  
SUBJECT TO AMENDMENT

WITHOUT NOTICE  
WORK ORDER  
NO. 34331 M.L.J

REMOVED FROM UNDER REVIEW PER  
11/09/28 UNDER REVIEW EGNH 11-664  
4/11/15 FOR PRO-SEALING SHEET 2.11.07.26

DEO ATTACHED

RELEASED  
2009-10-29

D	REFORMAT/REVISE GENERAL NOTES/PART LIST; REORGANIZED VIEWS AND REFORMATTED DRAWING TO CURRENT STANDARDS; ADD -141B (ZN B4-2, D4-2); REMOVED REF & ADD TOLERANCES (ZN B4-3, C6-3, C8-3 & B6-3); RELOCATED FLAG #6 PER PAR 08-046 (ZN A5-3); MOVED TURNING DETAIL & UPDATED TOLERANCE TO SHEET 4	RF	09.09.30
C	REMOVE -851 ABRASION STRIP; ADD MAGNOBOND 6398, CUSHION, REVERSE CLAMPS	PH	07.03.08
B	ADD HOLES FOR COMPATABILITY WITH BHT/AA SKIDTUBES	PH	05.02.04
A	NEW ISSUE	PH	00.12.12
REV.	DESCRIPTION	BY	DATE
DESIGN	PH	DART AEROSPACE LTD HAWKESBURY, ONTARIO, CANADA	
DRAWN	RF		
CHECKED	90	DRAWING NO.	REV. D
MFG. APPR.	15	D212-664-141	SHEET 1 OF 4
APPROVED	10	TITLE	SCALE
DE APPR.	11	XTUBE ASSY (205/212/412 HI FWD)	NTS
DATE	09.09.30	COPYRIGHT © 2000 BY DART AEROSPACE LTD THIS DOCUMENT IS PRIVATE AND CONFIDENTIAL AND IS SUPPLIED ON THE EXPRESS CONDITION THAT IT IS NOT TO BE USED FOR ANY PURPOSE OR COPIED OR COMMUNICATED TO ANY OTHER PERSON WITHOUT WRITTEN PERMISSION FROM DART AEROSPACE LTD	

**Dart Aerospace Ltd**

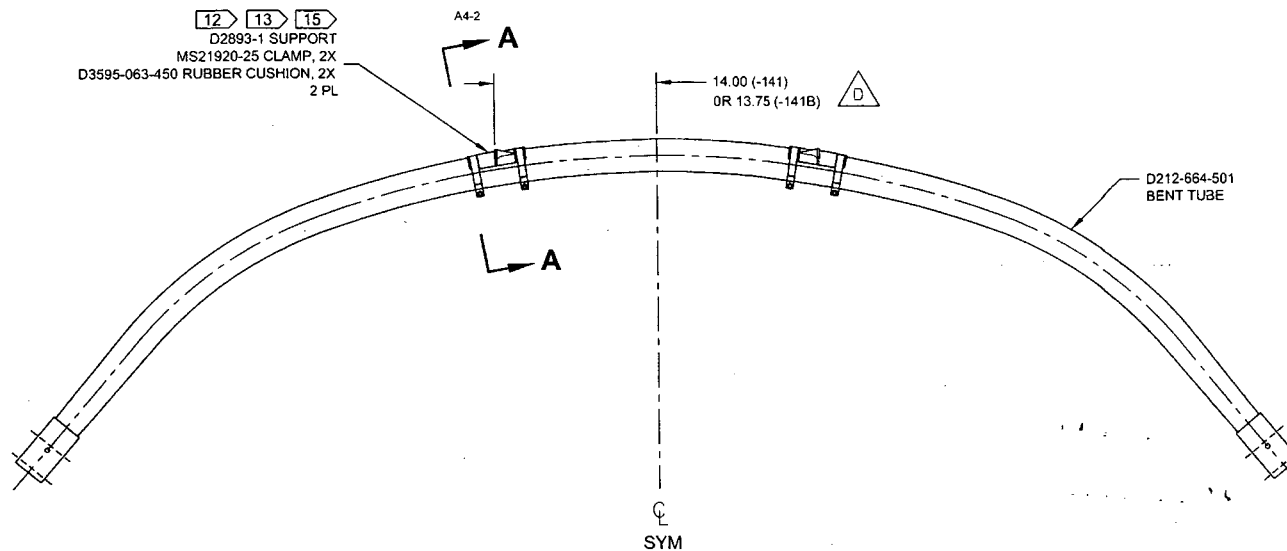
W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_  
 Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

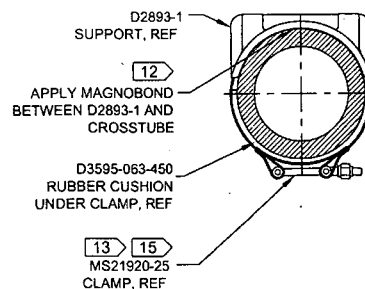
NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries

74331



**D212-664-141/-141B**  
**ASSEMBLY DETAIL**



**SECTION A-A**  
SCALE 4X

ECN 11-614  
1.07.20  
**UNDER REVIEW**  
11.08.13

**DEO ATTACHED**

**RELEASED**  
2009-10-29

DESIGN	PH	<b>DART AEROSPACE LTD</b>	
DRAWN	RF	HAWKESBURY, ONTARIO, CANADA	
CHECKED	90	DRAWING NO.	REV. D
MFG. APPR.	18	D212-664-141	SHEET 2 OF 4
APPROVED	10	TITLE	SCALE
DE APPR.	11	XTUBE ASSY (205/212/412 HI FWD)	NTS
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**Dart Aerospace Ltd**

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

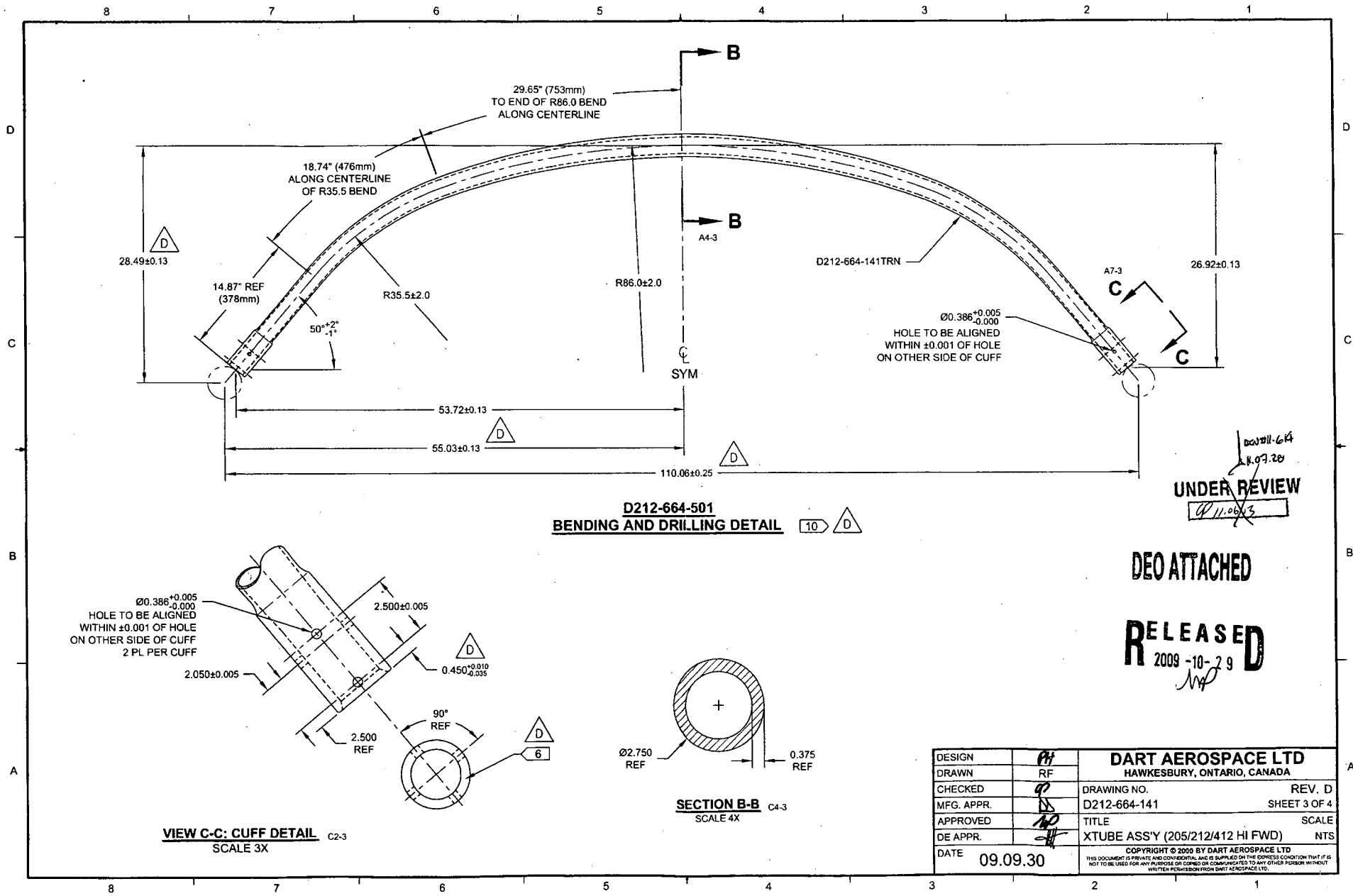
Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries

74331



**D212-664-501**  
**BENDING AND DRILLING DETAIL**

UNDER REVIEW  
11.06.13

DEO ATTACHED  
**RELEASED**  
2009-10-29

DESIGN	PH	<b>DART AEROSPACE LTD</b>	
DRAWN	RF	HAWKESBURY, ONTARIO, CANADA	
CHECKED	90	DRAWING NO.	REV. D
MFG. APPR.	10	D212-664-141	SHEET 3 OF 4
APPROVED	10	TITLE	SCALE
DE APPR.	10	XTUBE ASS'Y (205/212/412 HI FWD)	NTS
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**Dart Aerospace Ltd**

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

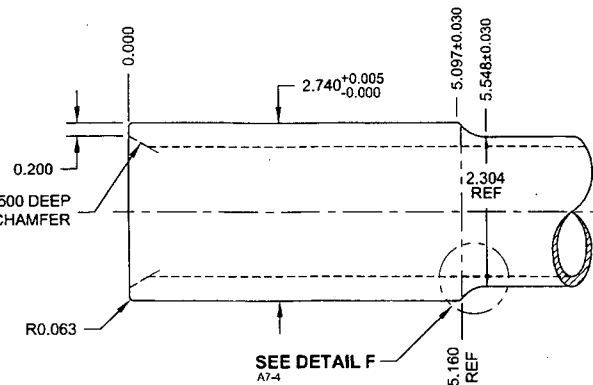
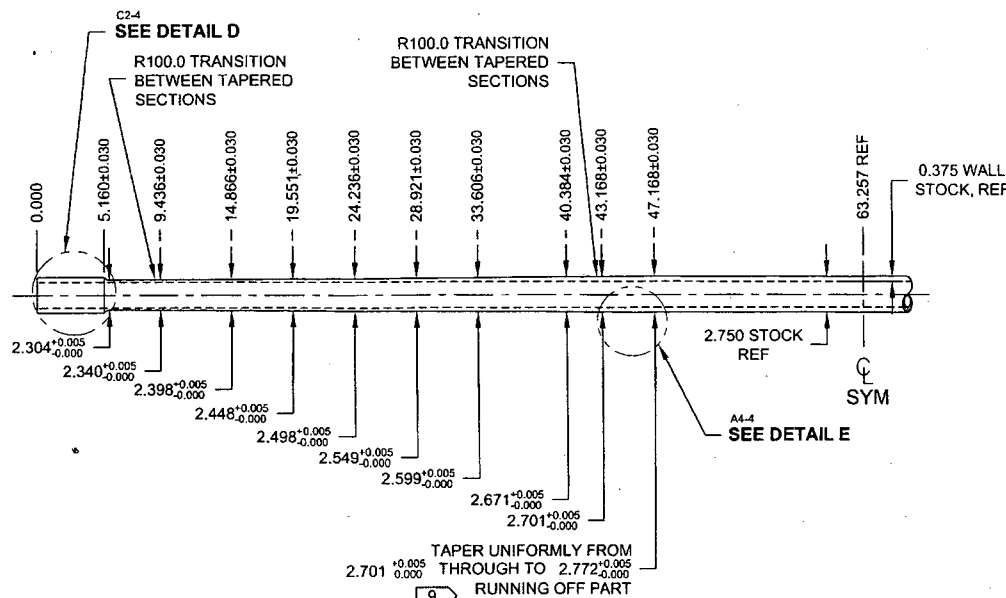
Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

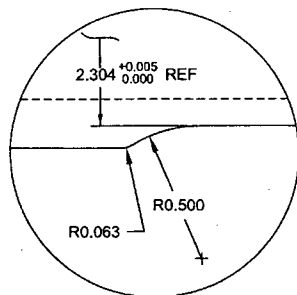
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DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries

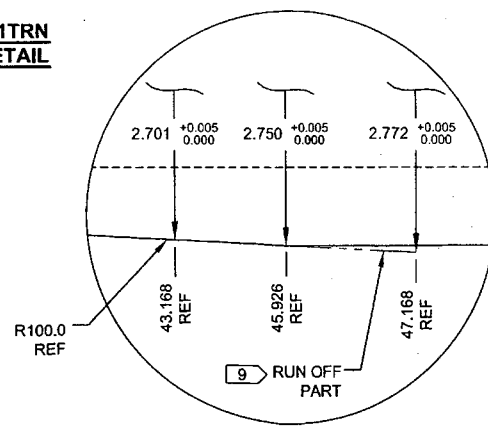
74331



DETAIL D:  
 CROSSTUBE CUFF D8-4  
 SCALE 5X



DETAIL F:  
 CUFF TRANSITION C2-4  
 SCALE 10X



DETAIL E:  
 TAPER RUN-OFF C5-4  
 NOT TO SCALE

D212-664-141TRN  
 TURNING DETAIL

UNDER REVIEW  
 11.06.13

DEO ATTACHED

RELEASED  
 2009-10-29

DESIGN	PH	DART AEROSPACE LTD	
DRAWN	RF	HAWKESBURY, ONTARIO, CANADA	
CHECKED	90	DRAWING NO.	REV. D
MFG. APPR.	13	D212-664-141	SHEET 4 OF 4
APPROVED	14	TITLE	SCALE
DE APPR.	14	XTUBE ASS'Y (205/212/412 HI FWD)	NTS
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**Dart Aerospace Ltd**

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries



74331

DRAWING NO. D212-664-141	TITLE XTUBE ASSY (205/212/412 HI FWD)	REV. D	DART AEROSPACE LTD ENGINEERING ORDER		D.E.O. NO. D212-664-141-D-1	SHEET NO. SHEET 1 OF 2	SCALE NTS
DRAWN	CHECKED	MFG. APPR.	APPROVED	DE APPR.			
DATE 11.04.07	DATE 11.07.11	DATE 11.04.12	DATE 11/04/12	DATE 11.04.12			

**PURPOSE:**

ADD AN INSPECTION WINDOW TO UNDERSIDE OF CROSSTUBE.

**CHANGE:**

NOTES 2 OF SHEET 1 IS AMENDED AS FOLLOWS:

**IS:**

- 2) FINISH: CHEMICAL CONVERSION COAT PER DART QSI 005 4.1  
PRIME INSIDE AND OUTSIDE PER DART QSI 005 4.2  
MASK UNDERSIDE OF CROSSTUBE AS SHOWN (HATCHED AREA) AND  
PAINT OUTSIDE PER DART QSI 005 4.2  
REMOVE MASKING AND APPLY CLEAR COAT

**WAS:**

- 2) FINISH: CHEMICAL CONVERSION COAT PER DART QSI 005 4.1  
PRIME INSIDE AND OUTSIDE PER DART QSI 005 4.2  
PAINT OUTSIDE PER DART QSI 005 4.2

**RELEASED**  
2011-04-18

**UNDER REVIEW**

14/06.13  
12 02.11-614  
11.07.28

**Dart Aerospace Ltd**

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries

74331

DRAWING NO. D212-664-141	TITLE XTUBE ASSY (205/212/412 HI FWD)	REV. D	DART AEROSPACE LTD ENGINEERING ORDER	D.E.O. NO. D212-664-141-D-1	SHEET NO. SHEET 2 OF 2	SCALE NTS
DRAWN	CHECKED	MFG. APPR.	APPROVED	DE APPR.		
DATE 11.04.07	DATE 11.04.11	DATE 11.04.12	DATE 11/04/12	DATE 11.04.12		

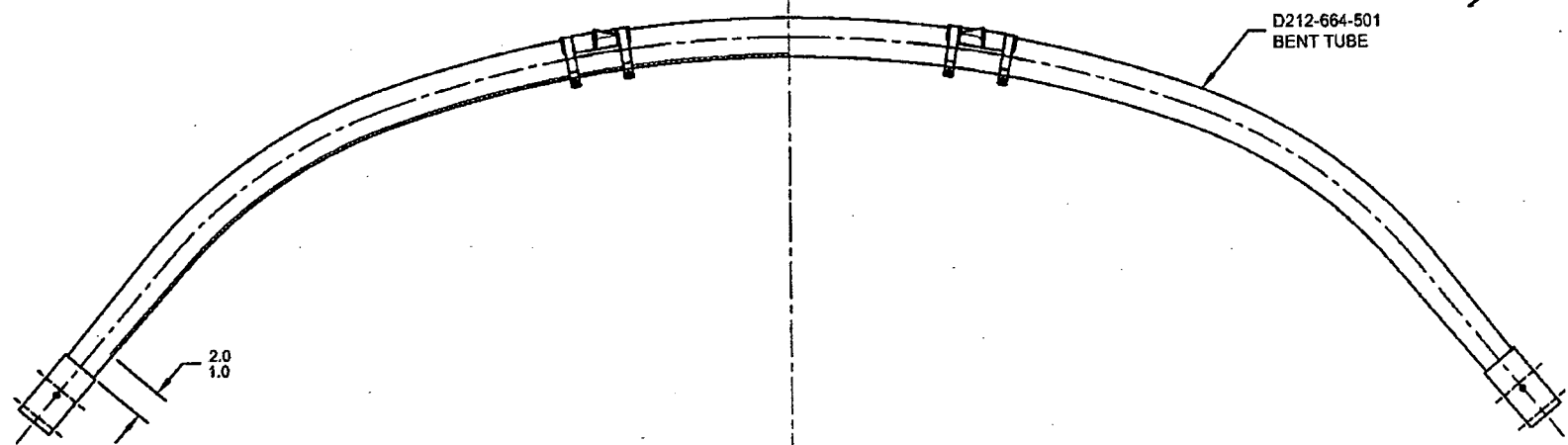
IS:

WAS:

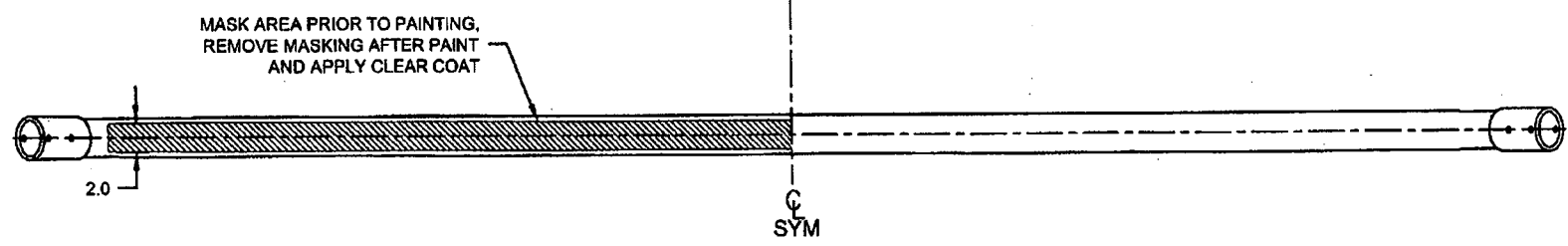
**UNDER REVIEW**

11/06/13

ECN# 11-614  
11.07.28



**D212-664-141/-141B**  
**ASSEMBLY DETAIL**



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**Dart Aerospace Ltd**

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_  
 Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries

## 5.0 PARTS LIST

## REFERENCE ONLY

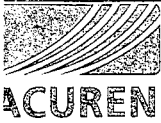
## 5.1 HIGH GEAR CROSSTUBES

Item	101	-201	-203	Part Number	Description
	X			D212-664-101	CROSSTUBE INSTALLATION, 204/205/210/212/214/412, UH-1H, UH-1A/B/E/F/L/P, TH-1F/L, HH-1K HIGH FWD
		X		D212-664-201	CROSSTUBE INSTALLATION, 204/205/210/212/214, UH-1H, UH-1A/B/E/F/L/P, TH-1F/L, HH-1K HIGH AFT
			X	D412-664-203	CROSSTUBE INSTALLATION, 412 HIGH AFT
1	1			D212-664-141	CROSSTUBE ASSEMBLY, 204/205/210/212/214/412, UH-1H, UH-1A/B/E/F/L/P, TH-1F/L, HH-1K HIGH FWD
2		1		D212-664-241	CROSSTUBE ASSEMBLY, 204/205/210/212/214, UH-1H, UH-1A/B/E/F/L/P, TH-1F/L, HH-1K HIGH AFT
3			1	D412-664-243	CROSSTUBE ASSEMBLY, 412 HIGH AFT
10	2			* D2893-1	SUPPORT
11	4			* D3595-063-450	RUBBER CUSHION
12	4			* MS21920-25	CLAMP (OR MS21042-26)
13	4			AN6-35A	BOLT
14	4			AN6-36A	BOLT
15	6			MS21042L6	NUT (OR MS21042-6)
16	18			AN960JD616	WASHER
20		2		* D2940-1	SUPPORT
21		4		* D3595-063-530	RUBBER CUSHION
22		4		* MS21920-28	CLAMP (OR MS21042-30)
23		4		AN6-40A	BOLT
24		2		AN6-41A	BOLT
25		6		MS21042L6	NUT (OR MS21042-6)
26		18		AN960JD616	WASHER
30			1	* D2896-1	SUPPORT
31			2	* D2856-600-1009	ABRASION STRIP
32			2	* D3595-063-570	RUBBER CUSHION
33			4	* MS21920-28	CLAMP
34			2	* MS21920-30	CLAMP (OR MS21042-32)
35			4	AN6-40A	BOLT
36			2	AN6-41A	BOLT
37			6	MS21042L6	NUT (OR MS21042-6)
38			18	AN960JD616	WASHER
39			2	* D3189-1	CHAFING SHIELD
50	1	1		D3428-1	PLACARD

\*REFERENCE ONLY. PARTS ARE INCLUDED IN D212-664-141/241 OR D412-664-243 ASSEMBLIES ABOVE  
NOTE: KITS INCLUDE EXTRA HARDWARE FOR COMPATIBILITY WITH BOTH DART AND BELL/AA  
SKIDTUBES.

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Revision: F  
Date: 08.09.05



# LIQUID PENETRANT TEST REPORT

P- 05631

PAGE 1 OF 1

CLIENT

DART AEROSPACE

DATE

OCT-05-2011

TIME

AM

PM

ATTENTION

LYDIA/CHANTALE/LIAN/MATT

ACUREN JOB NO.

188-11-02189

ADDRESS

1270 ABERDEEN ST.  
HAWKES BURY, ON

PO/NO.

15101

WORK LOCATION

AS ADDRESS

ACCEPTANCE STD.

ASTM1417/AST038

REV./DATE

2005

PROJECT

PT WET FLUORESCENT ON 6 "CROSSTUBES"

ITEM(S) EXAMINED

- SEE BELOW -

JOB DESCRIPTION

PROCEDURE NO. LT003 REV./DATE 2007

TECHNIQUE NO. LT-003 REV./DATE 2007

PART NO.

MATERIAL ALUMINUM

THICKNESS

N/A

SCOPE

PERFORMED A WET FLUORESCENT LIQUID PENETRANT INSPECTION ON 100% OF THE EXTERNAL SURFACE OF ITEMS MENTIONED BELOW

## TEST DETAILS

METHOD	<input checked="" type="checkbox"/> FLUORESCENT	<input type="checkbox"/> VISIBLE	<input checked="" type="checkbox"/> WATER WASH	<input type="checkbox"/> SOLVENT REMOVABLE	<input type="checkbox"/> POST EMULSIFIED
FAMILY BRAND	MAGNAFLUX		BLACK LIGHT S/N 13798	<input checked="" type="checkbox"/> OUTPUT > 1000 $\mu$ W/cm <sup>2</sup>	<input type="checkbox"/> AMBIENT < 2 fc
PENETRANT	ZN-67	MINIMUM DWELL TIME 10 MIN.	LIGHTING EQUIP. <input type="checkbox"/> FLASHLIGHT <input type="checkbox"/> TROUBLELIGHT	<input type="checkbox"/> OUTPUT > 100 fc @ SURFACE	
PENETRANT REMOVER	H <sub>2</sub> O	MINIMUM DRY TIME > 10 MIN.	OTHER		
DEVELOPER	SKD-33	MINIMUM DWELL TIME 10 MIN.	LIGHT METER S/N		CAL DUE DATE Aug/2012
DEVELOPER TYPE	<input type="checkbox"/> NON AQUEOUS <input type="checkbox"/> AQUEOUS <input type="checkbox"/> DRY				

## TEST SURFACE

SURFACE CONDITION	<input type="checkbox"/> AS GROUND	<input type="checkbox"/> AS WELDED	<input type="checkbox"/> MACHINED	<input type="checkbox"/> SHOT BLASTED	<input checked="" type="checkbox"/> CLEAN BARE METAL
SURFACE TEMPERATURE	<input type="checkbox"/> < - 4°C/ 20°F	<input type="checkbox"/> - 4°C/ 20°F TO 10°C/50°F	<input checked="" type="checkbox"/> 10°C/50°F TO 52°C/125°F	<input type="checkbox"/> > 52°C/125°F	

RESULTS-

(☐ METRIC ☐ IMPERIAL)

1 CrossTube W.O. ID 73041  
2 74331  
3 72708  
4 72709  
5 70720  
6 70721

ITEM ID D212-664-101 FWD  
D212-664-101 FWD  
D206-667-103 FWD  
D206-667-103 FWD  
D206-667-203 AFT  
D206-667-203 AFT

NO RELEVANT INDICATION WAS DETECTED  
AS PER APPLICABLE STANDARDS

11.10.06

## Scope of Services

The agreement of Acuren Group Inc. to perform services extends only to those services provided for in writing. Under no circumstances shall such services extend beyond the performance of the requested services. It is expressly understood that all descriptions, comments and expressions of opinion reflect the opinions or observations of Acuren Group Inc. based on information and assumptions supplied by the owner/operator and are not intended nor can they be construed as representations or warranties. Acuren Group Inc. is not assuming any responsibilities of the owner/operator and the owner/operator retains complete responsibility for the engineering, manufacture, repair and use decisions as a result of the data or other information provided by Acuren Group Inc. In no event shall Acuren Group Inc.'s liability in respect of the services referred to herein exceed the amount paid for such services.

## Standard of Care

In performing the services provided, Acuren Group Inc. uses the degree, care and skill ordinarily exercised under similar circumstances by others performing such services in the same or similar locality. No other warranty, expressed or implied, is made or intended by Acuren Group Inc.

## SIGNATURES

CLIENT REPRESENTATIVE

Matthew Murphy

PRINT

Matthew Murphy

SIGNATURE

DTR # F44759

TECHNICIAN (SIGNATURE):

Steve Desjardins

1<sup>st</sup> TECHNICIAN

2<sup>nd</sup> TECHNICIAN

NAME (PRINT):

CGSB LEVEL

SNT LEVEL

CGSB REG. NO.

3049

CGSB LEVEL

SNT LEVEL

CGSB REG. NO.

REPORT

REVIEWED BY:

NAME

INITIALS